AN 18th CENTURY CLINICOPATHOLOGIC CORRELATION

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THAT knowledge is to be gained from autopsies was shown to be of value for the understanding of clinical syndromes long ago by such scholarly physicians as Lancisi and Morgagni, yet postmortem examinations remain the exception rather than the rule. Even in revolutionary America, however, autopsies were performed for diagnostic purposes. In 1807, in an anonymous oration published in a Massachusetts journal designed for both doctors and farmers, the orator stated the case for autopsies much as we do today:[1]

> With a view to enlarge our knowledge of the nature of diseases, we ought to open dead bodies as often as it may be convenient. . . . We know that the most rational method of treating diseases is founded on a knowledge of their seats and proximate causes; and it has been long confessed that the . . . history of the phenomena discovered on opening bodies . . . is of the last consequence in acquiring that knowledge. . . . It is to be hoped, my friends, that a superstitious veneration for the relics of the dead will ere long be done away, and that physicians will be permitted unreservedly to explore an avenue so highly important towards the investigation of the nature of diseases.

The four or five physicians practicing in Portsmouth, N. H., at any one time between 1760 and 1820 cared for a total population of 4,000 to 6,000 people. The unusually detailed bills of mortality for Portsmouth compiled in 1801-1811 by Lyman Spalding, and in 1818-1820 by Richard Thurston,[2] provide data which are representative of the town's health statistics for the entire Revolutionary and Federalist period.

From their data and from concurrent United States Census reports we can calculate that the crude death rate was 18.1 per 1,000 population at the time. The causes of death, as diagnosed by Portsmouth's

CAUSES OF DEATH DIAGNOSED BY PHYSICIANS IN PORTSMOUTH, N.H., 1801-1820, WHICH COULD HAVE BEEN MADE ONLY AT AUTOPSY

Diagnosis	*Age at death*	*No.*
Mortification [gangrene] due to ossified arteries	77 years	1
Ossification of aortic valve	39 years	1
Patent foramen ovale	2 to 17 years	3
Malformation of the heart [unspecified]	6 and 8 days, 13 years	3
Aneurysm	26 and 57 years	2
Diseased vertebrae	24 years	1
Scirrus [sic] bladder	74 years	1
Scirrus [sic] liver	25 to 65 years	9

physicians, are given for about 1,650 patients by Spalding and Thurston. Many of the diagnoses are difficult to interpret in terms of modern nomenclature. But some of them could have been made only at autopsy (see accompanying table).

In addition, at least one of two patients who were diagnosed as having succumbed to angina pectoris was autopsied. The results were included in John Warren's paper on angina pectoris in 1812.[3] Thus, at least 1.3% of people dying in Portsmouth seem to have been studied postmortem, and this may be an underestimate of unknown proportions.

One autopsy performed in post-Revolutionary Portsmouth, but before Spalding began his compilations, deserves study in light of today's understanding of the pathophysiology of heart disease. The physician's discussion of this remarkable clinicopathologic correlation is consistent with today's concepts of cardiac physiology, although we are still unable to attach a modern diagnostic label to the case.

The discusser—who probably was also the prosector—was a Portsmouth surgeon, Dr. Hall Jackson (1739-1797). Like most colonial American physicians, Jackson received his professional training by apprenticeship. Jackson was an apprentice to his father and his uncle, and spent the year 1762 studying on hospital wards in London. His local fame stemmed from his expertness in administering smallpox inoculations, in couching for cataract, in amputating limbs, and in obstetrics. Today Jackson is remembered chiefly because he was the first to introduce William Withering's discovery of the value of digitalis in the treatment of dropsy to America.[4]

A month after he wrote to Withering to ask for some seeds of the

foxglove, because it was not indigenous to America, Jackson performed an autopsy on General William Whipple. He sent his only copy of his findings and conclusions to William Plumer (1759-1850), a lawyer and future United States senator, in nearby Epping, N. H. Just why Jackson sent this detailed report to Plumer is not clear. Plumer may have had some professional medicolegal need to know. It is more likely that he was already collecting material for the biographical notes that he would compile over many years. Whipple had been a distinguished citizen of New Hampshire, and, as will be seen, his disease was well known to others throughout the state.

Whipple was born in 1730 in Kittery, Me., just across the Piscataqua River from Portsmouth. By the time he was 21 he had risen from cabin boy on a merchant vessel to captain. In 1759 he went into the shipping business in Portsmouth with his brothers. His elegant mansion, known as the Moffatt-Ladd House, is open to visitors today. As tension between the colonies and Great Britain heightened, Whipple gave up his mercantile interests. He became a member of the local Committee of Safety, a representative to the Provincial Congress in 1775, and one of New Hampshire's delegates to the Continental Congress at Philadelphia (with Doctors Josiah Bartlett and Matthew Thornton). Because of his long experience in shipping, he devoted much of his energy to various marine and commercial committees of the Continental Congress.[5-10]

In 1777 Whipple was appointed brigadier general of one of the two New Hampshire brigades, and immediately marched off to participate in the defeat of Burgoyne at Saratoga. Although most of the troops from New Hampshire went on to Valley Forge that winter, Whipple was the officer in charge of the British prisoners marched to Boston. His only other major military campaign was at the siege of Newport in the following year.[5-10]

The remainder of Whipple's life was summarized both clinically and politically by Nathaniel Adams, who must have known him in Portsmouth:[5]

> About this time [1778] the General began to be troubled with strictures in the breast, which were at times very painful to him. A little exercise would bring on violent palpitations of the heart, which were very distressing. Riding on horseback often produced this effect, and sometimes caused him to faint.

> This complaint prevented his engaging in the active scenes of life, and induced him to resign his military command. On the 20th of June, 1782, he was appointed a Judge of the Superior Court of Judicature. . . . He continued on the bench about three years, but his disorder became more painful to him; and in the fall of this year [1785], he was obliged to leave the Court before the Circuit was completed. He departed this life on the 10th day of November, in the fifty-fifth year of his age. By his special direction to his brother [-in-law], Doctor Brackett, his body was opened, and it was found that an ossification had taken place in his heart; the valve was united to the aorta, only a small aperture, the size of a large knitting needle, was open, through which all the blood flowed in its circulation; and when any sudden motion gave it a new impulse, it produced the palpitation and faintness, to which he was liable.

It is perhaps curious that Adams gives us such a detailed description of the autopsy findings in his book of local history. It seems that the autopsy as well as the findings were unusual enough to warrant their reporting outside the medical profession. Even Whipple's obituary in the local newspaper graphically described his last days: "During the long course of unequaled sufferings, he endured his lot with a firmness correspondent to the greatness of his mind. He viewed his approaching dissolution with a heroic fortitude, in full confidence, that He who made him knew best how to dispose of him. In his extremest agonies . . . ."[9]

Although Whipple's instruction that an autopsy be performed was given to his brother-in-law, it is not probable that Brackett actually performed the dissection himself. In his description Jackson gives every indication that he performed it himself, although he never says so explicitly.

Jackson's report to lawyer William Plumer, which is in volume 1 of the *Plumer Letters* in the New Hampshire State Library in Concord, is published below for the first time:

> Portsmouth February 20th 1786
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> Sir,
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> Enclosed is a rough sketch of General Whipple's very remarkable case. I have not time or patience to transcribe it. You

have it with all its imperfections & inaccuracies, which I doubt not your (as well as every other gentleman who may see it) goodness & candour will overlook. I have no copy, & when you have used it as you may think proper, you will be so obliging as to return it.

Your most humble servant
Hall Jackson

William Plumer Esqr
Epping

William Whipple Esqr having for several years laboured under a disorder, the symptoms of which were of a peculiar nature, & such as to lead the Faculty in general to conclude that some material defection in or near the heart, had taken place. They were much divided in their opinions, some concluded a Polypus had formed, others that an aneurism of the aorta, or pulmonary artery's [sic].

The general or most prevailing symptoms that attended the disorder, were, that the least encreased exercise of body or mind, or whatever in the smallest degree accelerated the motion of the blood, an uncommon palpitation of the heart, dyspena [sic], & swooning, took place.

The fatigues of the last Superior Court circuit, so agravated [sic] these alarming symptoms as to deprive him of every expectation or hope of surviving; he gave directions that after his death his body should be opened, that the nature of his disorder if possible might be ascertained. The melancholly [sic] event took place on the 28th instant: & the following day agreeable to his request, the body was inspected, & the following appearances & observations made.

On raising the sternum the pericardium first presented, so much enlarged as to pressure the lungs much higher than in a natural situation; there appeared to be a larger proportion of fat on the pericardium than on the other viscera; in the cavity of the thorax was about one half pound of water, on opening the pericardium little or no water was found within it. The right auricle of the heart was enlarged to a surprising degree, so as closely to fill up, & greatly enlarge the pericardium. On the

superior & anterior part of the auricle a little inclined to the right side was an appendage nearly the bigness of a hen's-egg, irregular, of a livid color, & appeared like a large glandular tubercle, approaching to a state of putrefaction, but on pressing it gently it lessened by discharging part of its contents into the cavity of the auricle; on opening the auricle, which by its distention had become less than half its natural thickness, & the cavity so much enlarged as to be capable of containing three times the natural quantity at the least computation. On examining the internal surface of the auricle, the beforementioned appeared to be the internal coat of the auricle, abraded through in a great number of holes, which gave it the appearance of net work, the external coat of the auricle was pushed out, & formed this appendage, or rupture, which contained a considerable quantity of a grumous substance, of a consistence rather firmer than co-agulated blood, & not altogether unlike what by some might be termed a polypus. On endeavoring to pass the finger from the auricle to the ventricle to the entrance was found to be closed up with a firm ossification. The valvule [sic] tricuspides had become a solid bone & wholly closed the passage from the auricle to the ventricle excepting two small perforations that might admit a large sized probe; not a single drop of blood could pass from the auricle to the ventricle but what passed through these two apertures: Just above or rather thro' the upper edge of the ossification was an opening that passed downward in an oblique direction from the right auricle to the left ventricle, immediately under the valvules mistrales [sic]. This opening would admit the little finger. The foramentrale [sic] was not open; the walls of the left auricle, as well as those of the pulmonary arteries, were in a perfect sound & natural state; the heart in every other respect had a healthy appearance, not the least preternatural adhesion or a single tubercle was found in the whole viscera, but exhibited a remarkable appearance of sound health and longevity.

When it is considered how irregularly & sparingly the lungs must have been supplied with blood, & consequently the left ventricle of the heart by the pulmonary viens [sic], it must be concluded that unless the preternatural opening from the right

auricle to the left ventricle had been formed, the ventricle would not have been supplied with a quantity of blood sufficient to have filled it immediately, & thereby excited a force necessary to propel the blood through all the remote ramifications of the arteries, even as it was, the circulation was so languid that no pulsation could be perceived in the radical [sic] artery, or any other equally large or remote from the heart, for a long time before his death.

When it is considered how small a proportion of blood could be circulated through the lungs to receive the benefit of air & when also it is considered that so remarkable an obstruction should so long subsist in the very fountain and source of life, it must be a matter of wonder & astonishment that life could be so far prolonged, and with no more inconvenience. He appeared to enjoy a tolerable state of health, unless interrupted by encreased exercise, & at his death he was far from being an emaciated subject.

Portsmouth Nov 30th 1785

P S. On since examining the ossification *(en situ)* it was found that a small fissure running transversely from the sides of the ossification about half an inch in length, & somewhat more than a line in breadth, terminating at each extremity in the two small perforations before mentioned. This fissure & opening appeared at the edges and points of the valves not fully ossified. The papillae & upper extremities of the fleshy columns of the right ventricle were formed into numberless bony concretions. On raising the ossified valves the fleshy & tendenous columns could be drawn up, but in no situation would close the fissure, or perforations, to prevent the refluxe of blood into the auricle, a freer exit into the pulmonary arteries might prevent a return, the other way.

It is conjectured the right auricle was always filled, that by the great distension it had lost its contractile power; that the blood flowed in a slow, but a continued stream into the left ventricle through the preternatural opening from the right auricle; what could prevent the refluxe of blood from the ventricle into the auricle, through this opening, could not be ascertained.

The finger would pass readily each way, without the least appearance of a valve.

On the least increased exercise the muscular motions of the heart was encreased, little or no blood being returned from the lungs, & the preternatural opening from the right auricle to the left ventricle, being insufficient to replace the blood thrown into the aorta, the heart from being suddenly emptied lost its action, an immediate syncope took place, which would deprive him of all motion and sensation, in less than a minute the ventricle being filled, excited the heart to renew its action, when he would recover, from his faintness and state of insensibility.

He complained before his death of pain in his breast, immediately over the diseased part of the right auricle, & it's very probable had he survived a short time, the auricle would have been compleatly ruptured, instantaneous death would have been the consequence.

The circulation of blood was so languid in the extremities, that he would complain of his hand & feet being cold, in the hottest day of summer.

It is apparent from Jackson's notes that Nathaniel Adams' account[5] contains two errors. Whipple died not on November 10th but on the 28th, and the valve was not united to the aorta—that would have been an extraordinary anomaly indeed.

The anatomical diagnosis of Whipple's heart disease remains a challenge today. There is a possibility, however, that the lesion is so rare as not to fit any of today's diagnostic categories.

Several interpretations of Jackson's findings have been made for me. For instance, it has been suggested that this is the first known case of overriding tricuspid valve with communication between the right atrium and the left ventricle, and tricuspid stenosis. Secondary features include aneurysmal dilatation of the right atrium, probable antemortem mural thrombosis of the right atrium, atrial fibrillation, and congestive heart failure with hydrothorax.[11] However, overriding tricuspid valve is a rare and obscure congenital defect. The underlying problem may have been that the right ventricle was unusually small rather than that the valve was malpositioned.

Others feel that there is no evidence for an overriding valve, but that the definite shunt between the right atrium and the left ventricle

was accompanied by extraordinary tricuspid stenosis and ossification.[12] Although there is no evidence that cyanosis was present, there must have been some deficiency of oxygen in the arterial blood, because very little blood was able to get into the lungs.

We can only speculate as to whether General Whipple would have benefitted from the administration of digitalis had it been available to Dr. Jackson before he finally brought it to Portsmouth the following year.[4] Jackson had been interested in dropsy long before Withering's book appeared, and would have tried all the conventional therapeutic methods—although it is not clear that Whipple's hydrothorax was detectable on clinical examination. Because of the advanced stenosis of the valves it is unlikely that the patient would have gained much respite from his symptoms even had the new wonder drug been in his physician's hands.

Regardless of the nomenclature of the diagnosis, Jackson's detailed and knowledgeable description of General Whipple's long illness (which is verified by the nonmedical accounts of others) and his explanation of Whipple's symptoms, based on the autopsy findings, shows that Jackson had a remarkably keen comprehension of cardiovascular pathophysiology. It must be assumed that Jackson was not unique among physicians of the Revolutionary period in his mastery of cardiovascular concepts and that at least a few other physicians shared the same body of knowledge. Because virtually none of this knowledge could have come from experimentation or from the kind of diagnostic study that is common today, we can only assume that Jackson had gained most of his continuing medical education from the medical literature, as exemplified by his study of Withering's book in 1785.[4] However, the medical literature of the 18th century is almost completely devoid of studies which might be relevant to General Whipple's disease; therefore we are left to conclude that much of Jackson's relatively sophisticated discussion is based largely on his own inferences, without recourse to previous authorities.

This might well be expected. As King has commented, "The eighteenth century physician was expected to be a keen and discriminating thinker. . . . He must observe accurately, reflect carefully, and reason soundly."[13]

Jackson's discussion of the clinical implications of his postmortem findings on Whipple's heart needs no further pathophysiological expli-

cation, although it does need to be cast in modern concepts of classification of heart disease.

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